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severance and determination, and his success in making friends with the natives, he (the President) had every confidence that he, of all men alive, was the man most able to solve these difficult problems.

Colonel PLAYFAIR said the port north of the mouth of the Rovuma, which Livingstone had described, was one of which he had no personal knowledge; he should not, however, be surprised to hear of other harbours being discovered along that coast, for it had been most imperfectly surveyed. Only about a year ago an excellent harbour had been found by the Sultan of Zanzibar on the mainland, opposite the island; and he was now endeavouring to build a town there, but it is more than doubtful whether the experiment will succeed.

The following Paper was read:—

On the Physical Geography and Climate of Natal. By R. J. MANN, Esq., M.D., F.R.G.S., Superintendent of Education in Natal.

THE author exhibited numerous diagrams and maps in illustration of his subject, with a view to show how the peculiar climate and fertility of Natal depends upon its physical configuration. The colony is a portion of the narrow bevelled rim of the African continent, whose vast interior is an elevated table-land, with its coast presented to the moist winds of the Indian Ocean, and its interior frontier formed by the Drakenberg mountain-ledge, 7000 to 9000 feet high. In the northern part of the colony this mountain-ledge curves inwards, and from this hollow or bay the waters are gathered into one large river, the Tugela. From the salient point of the angular line of the Drakenberg, a mountain ridge projects into the middle of the colony, forming a high central backbone, from which short lateral spurs jut out. Each deep valley between these fingered ridges and to the south has its stream, and no less than fifty separate rivers find their way to the coast. These two distinct river systems of the colony—the one-rivered and the many-rivered—were necessarily caused by the zigzag direction of the great interior mountain frontier. There is a general slope upwards from the sea towards the interior; the gradient for the first 70 miles being 1 in 70. Up this slope the sea-breezes, impelled by a combined trade-wind and monsoon agency, blow almost continually, but most strongly in the summer, owing to the greater power of the sun on the land at this time, and it is in this season that most rain falls; the moisture-laden air, on reaching the heights, being no longer able to retain its humidity, discharges it in almost daily showers. Thus all the summer long the heat is tempered by clouds and the land fertilized by constant rains. During the winter, on the other hand, when the monsoon agency is at its least, there is almost perpetual sunshine and the weather is dry. The summer rainfall, as

the author had ascertained during eight years' observation, is about 24 inches; the winter rainfall only 6 inches. The temperature in summer commonly rises to 85° at midday, rarely to 97°, and at night very seldom descends to 52°. In winter it rises to between 70° and 80°, and rarely descends to 40°. There were five slight frosts in the eight years. The result of this peculiar climate, dependent on the geographical position and configuration of the land, is that sugar, coffee, arrow-root, pine-apples, bananas, and oranges, can be grown on the coast, whilst wheat, potatoes, and other food-crops, cattle, horses, and sheep thrive on the uplands, and Indian-corn and tobacco grow everywhere, the whole colony being only equal in area to one-third of England. The produce of the colony for one year, a year since, was 700 tons of sugar, 62,000 lbs. of coffee, 115 tons of arrow-root, 20,000 bushels of wheat, 500,000 bushels of Indian corn, 23,000 lbs. of tobacco; and there were then 290,000 cattle, 170,000 sheep, and 15,000 horses on its hills. The author explained the physical causes of the formation of the harbour of Natal, and gave many details of the mineral and vegetable productions of the country.

The Paper will be published at length in the Journal, vol. xxxvii.

The PRESIDENT, in returning thanks, said he had never heard a paper read which more clearly established the connection between climatology and geographical outline than this of Dr. Mann. It was Sir John Herschel who had induced Dr. Mann to make these accurate meteorological observations, extending over a series of years, and the paper communicated the results, in their connection with the physical geography of the region. Many persons might make observations of this description, but there were few who could put them together in such a philosophical form; and still fewer who could develope their knowledge with so much eloquence as Dr. Mann had done in this *vivâ voce* exposition of his subject.

Mr. CRAWFURD said he was very sorry he had little to object to in the eloquent discourse of Dr. Mann. His description of Natal was a great deal too attractive, it was enough to induce people to go there headlong. The climate, which was sub-tropical, was unequalled in the world; it surpassed that of Australia for salubrity and beauty. At the same time he thought Dr. Mann had overrated the fertility of the country. Arrow-root seemed to be the principal produce of Natal. Now the most valuable produce of a sub-tropical climate with an excellent soil would be sugar and coffee and not arrowroot. Again, nothing had been said about sheep and wool; and nothing about the vine. The country ought to produce tolerably strong wines. There were two other great defects of the colony, which Dr. Mann had discreetly passed over; there was not a single good harbour on the whole coast, that would admit a ship of 300 or 200 tons; and there was not a single navigable river.

Captain TOYNBEE said that the Mozambique current, which runs down between Madagascar and eastern Africa throughout the winter at a temperature of 78°, seemed to him to be the chief cause of the tropical climate of the coast districts of Natal. The reason why this tropical climate did not exist

on the western coast of Africa in the same latitude was, that at the same season of the year, the temperature of the sea is not greater than 50°.

Dr. MANN replied that if he had not been limited by the time allowed for his paper, what he said would have saved his friend Mr. Crawford from the necessity of asking these questions. The fact with regard to arrow-root was, that when the colony was first settled, men began to grow arrow-root before they were aware that they could produce more valuable articles. However, nine-tenths of those who began with arrow-root had abandoned the cultivation, and had turned their attention to sugar, coffee, and other things; and it was only in a few small corners of the country that arrow-root was now grown. With regard to the vine, he was surprised at Mr. Crawford's inquiry, because he had been giving them the results of a laborious investigation which showed that the summer at Natal is a summer of wet; therefore it would not answer, commercially, to grow the vine at Natal, for, to ripen the grapes easily, abundantly, and certainly, a dry summer is required. With regard to harbours, he had himself gone into the harbour of Natal, in vessels of 600 and 700 tons; and there was a vessel of 800 tons burden, now about to sail, that would have to go over the bar, unimproved as it is. The only difficulty was that ships of large burden could not pass over the bar except with a high tide; they were then tugged over by a steamer, occasionally just scratching the sand with their keels. But these difficulties would be got rid of by improving the harbour; and if his friend would give him 250,000*l.*, he would guarantee that a ship of 2000 tons should be able to enter the harbour within three years. It was entirely a question of outlay. With regard to sheep, when he first went out, nine years ago, he could not get a bit of mutton on his table; there was nothing but beef and antelope. Luckily, just at that time, it was discovered that sheep could be reared in the uplands; the result was that when he left the colony, a few months since, he could send to his butcher and get any amount of mutton he pleased.

Mr. CRAWFORD.—At how much per pound?

Dr. MANN.—At 6½*d.* and 7*d.* a lb. for the haunch and saddle. He was confident that, with a large amount of enterprise in the uplands, before another five years had passed, they would have 500,000 to 600,000 sheep. The other productions of the colony were numerous, they could really grow almost anything. Tobacco succeeded everywhere; beet-root in the uplands grows perfectly well; flax was grown with success; and they had grown cotton also with success: the only difficulty being that, up to the present time, labour was too costly for the cultivation of cotton in a general way. In many places the soil is so good that several crops are taken in succession off one piece of land without manuring. Three crops of oats have been produced from the same land in one year. With regard to Captain Toynbee's observation, it was true that something of the tropical condition of the coast did arise from the warm current from the north-east. Natal not only had the sun shining on its slopes, but it had a hot-water apparatus expressly provided to bring down additional heat. This, however, is certainly in Natal merely a subordinate influence. The coast climate is not largely dependent upon it. The proof of this is found in the fact that the sea-breeze is always refreshing and cool; and that the waters of Natal are crowded with fish. The Mozambique current does not come in close to land in Natal parallels.
